EXHIBIT D

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Irving DeVoe. Confirm. No.: 9677
Application Serial No.: 10/626,209 Group Art Unit: 1797
Filed: July 24, 2003 Examiner: Krishnan Menon
Docket Number: (Now 41613-101)
Title: SYSTEM AND METHOD FOR CONVERTING KINETIC ENERGY OF GASES OR LIQUIDS TO USEFUL ENERGY, FORCE AND WORK

DECLARATION UNDER 37 CFR 1.132

I, Irving DeVoe, Ph.D. declare and state that:

1. I, Irving W. DeVoe, am the sole inventor of the above referenced patent application that is published as Patent Application No. 2005/0016924 A1 on January 25, 2005, naming Irving DeVoe as the sole inventor, and being entitled "System and Method for Converting the Kinetic Energy of Gases or Liquids to Useful Energy, Force, or Work". I have reviewed the above referenced patent application prior to filing and again prior to making this declaration and I have also reviewed the currently pending claims and the most recent Office Action therein, dated July 2, 2008.

2. I am currently employed by Effusion Dynamics, LLC. A more compete CV is attached hereto as Attachment A

3. I received my B.Sc. in Chemistry from Aurora College, Aurora Illinois, in 1964.

4. I received my Ph.D. in 1968 from University of Oregon Medical School, Portland, Oregon in 1968.

5. Postdoctoral Fellow, Macdonald College of McGill University, Montreal, Canada. 1968 -1969.

6. I have worked on intellectual property issues during the course of my career and I am familiar with evaluating intellectual property with respect to potential patentability.

7. I am a named inventor on 6 issued US Patents.

DeVoe, Irving W. Apparatus for continuous removal of materials from a liquid . 1992 US Patent # 5089123

DeVoe, Irving W. et al. Removal of contaminants and recovery of metals from waste solutions. 1992. US Patent # 5173179

DeVoe, Irving W. Removal of contaminants and recovery of metals from waste solutions 1991. US Patent # 5066371

DeVoe, Irving W. et al. Insoluble chelating compositions. 1986. US Patent #4585559

DeVoe, Irving W. et al. Insoluble chelating compositions. 1985. US Patent # 4530963

DeVoe, Irving W. Insoluble chelating compositions. 1984. US Patent # 4626416

With reference to the published application, I declare and state that:

8. I have read and reviewed the above-identified Published Patent Application No. 2005/0016924 A1, published on January 25, 2005 and, as the sole inventor listed thereon, I understand the published patent application including its specification as well as all of the figures contained therein, and the currently pending claims.

9. I have read and reviewed the above-identified Office Action dated July 2, 2008 and understand the contents thereof and factual issued raised in or by the Office Action. In addition, I have reviewed the Loeb reference (US Patent 3,906,250) and the German reference (DE 3121968).

10. The invention described and claimed in the published patent application involves a system that provides for the osmotic fluid flow from a solvent chamber into a solute chamber to generate fluidic pressure that can be used to power a mechanical device such as a piston to convert the generated fluidic pressure into mechanical energy. The application describes the conversion of molecular kinetic energy, i.e., thermal energy, in one embodiment, to the kinetic energy of a piston. It is my opinion that both the Loeb and the German references function in a continuous manner and basis and that the extra energy the system uses for mechanical power is provided by the addition of a substantial volume of solvent being continuously added to the solute. In contrast, the presently claimed invention of DeVoe relies upon an increase in pressure (not volume) provided by the addition of a relatively small amount of solvent to the solute solution as it passes

through a semipermeable membrane from the solvent container into the solute container as described in the DeVoe specification. The Loeb and German references do not rely on an increase in pressure because of the continuous flow of solvent into the solute across the semipermeable membrane in what is not a closed system. The presently claimed invention clearly recites periodically extracting a small portion of the mixed solvent and solute solution at a high pressure to provide the necessary energy.

11. The Examiner in his office action has said that the figures do not show the hermetically sealed connections between the receiving chamber, the condenser, and the solvent chamber. The figures are block diagrams and are not mechanical drawings of the system. As a scientist and one of ordinary skill in the art, I understand that to maintain a vacuum between the various components, I would need to hermetically seal the joints between the various components or air would be able to enter the system and reduce or destroy the vacuum.

12. In the office action , the Examiner asserts my invention is not logically feasible and claims that given the volume of one liter of vapor compared to one liter of water, my system cannot physically work.

13. This shows a misunderstanding of how this system works. In my system, one liter of solvent solution may transfer across the semipermeable membrane leaving a one-liter space within the solvent chamber. However, unlike the prior art, my system does not add energy to the system through an increase of volume of solvent solution flowing into the solute solution. Rather my system adds energy to the system by the solvent solution flowing into the solute chamber and substantially increasing the pressure within the chamber. For each stroke of the member only a small volume of solute solution, typically set approximately between 1 ml (radial 3 piston engine) and 20 ml (single piston engine), depending on the engine, is removed from the solvent chamber, but this small volume has a very high pressure, typically the pressure is approximately between 500 psi (3447 kPa) and 1900 psi (13100 kPa). Thus, for each stroke of the member, only a volume of approximately 1 mL to 7 mL of solvent must be vaporized within the recycling

system. There is no need to vaporize the entire one-liter of solvent, for example, that has flowed into the solute chamber on a single stroke of the member. Thus, the Examiner is incorrect in his assertion that my system must vaporize the entire volume of solvent that flows through the semipermeable membrane in a single stroke of the member.

14. I have operated my system and have measured the following values during operation:

- Pressure in the solute chamber: 2200 psi (15,168 kPa)

Volume of solute removed per stroke: 3 mL - 20 mL (Radial 3 piston engine and single piston engine, respectively).

- Frequency of the stroke: 30 cycles per minute (@ 20 mL piston displacement; single piston engine) and 200 rpm (@ 3 piston radial motor; 1 mL displacement).
- Amount of solute recycled per stroke: 10 mL and 0.6 mL, respectively).
- Amount of solvent recycled per stroke: 0.3mL (solvent recycled in radial engine only) .
- Rate of flow of volume of solvent that flows across the semipermeable membrane: 600 mL/min in larger single piston engine and 600 mL in the radial engine.

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Irving DeVoe, Ph.D. Date 11/30/08

ATTACHMENT A

C.V. OF IRVING DEVOE, Ph.D.

CURRICULUM VITAE

Irving W. DeVoe, Ph.D.

Married, 5 children

Address: 197 Greenhaven Rd.
Pawcatuck, CT 06379

Registries

Who's Who in America (not kept current)
Who's Who in Canada (not kept current)
American Men and Women in Science (not kept current)

Work experience:

2003 – date	Chief Scientist & Manager Effusion Dynamics LLC Boston, MA
1995 – 2004	Chief Scientist and Principal MR3 Systems, Inc. San Francisco, CA
1992 – 1995	President Metanetix Technical Services, Inc. (Anaconda Copper Mine) Butte, Montana
1990 – 1992	President and Owner DeVoe Environmental Laboratory Palm Springs, CA
1988 – 1991	President, Chief Scientist, and Principal Metanetix, Inc. Camarillo, CA
1984 – 1987	Chairman and Chief Scientist DeVoe Holbein International Inc. The Hague, Netherlands

1978-1984	Professor and Chairman Department of Microbiology and Immunology Faculty of Medicine McGill University Montreal, Canada
1978 -1984	Medical Scientist: Royal Victoria Hospital Montreal, Canada
1978 – 1984	Medical Scientist, Montreal General Hospital Montreal, Canada
1970 – 1978	Associate Professor Department of Microbiology Faculty of Agriculture Macdonald College of McGill University Ste. Anne-de-Bellevue, Quebec, Canada
1969 – 1970	Research Associate Argonne National Laboratory U.S. Atomic Energy Commission Argonne, IL
1968 – 1969	Post-Doctoral Fellow National Research Council Canada, Macdonald College, McGill University, Montreal, Canada

Research

1964 - 1969	Metal requirements and interactions with organic molecules in the cell walls and membranes of bacteria.
1970 – 1984	(1) Pathogenesis of meningococcal meningitis; Microbial physiology and biochemistry as it relates to pathophysiology in the human host; (2) Microbial electron transport systems in *Neisseria meningitidis;*

(3) *In vivo* studies of meningeal pathogenesis in rabbits inoculated with *Neisseria meningitidis* in cerebral left lateral ventricle.
(4) Electron microscopy (Scanning, transmission, freeze-etching);
(5) Iron requirements and uptake from human transferrin by virulent and avirulent meningococci;
(6) Blockage of step in leukotriene synthetic pathway after exposure to cell wall fragments of meningococci.

1968 Ph.D. Microbiology and Immunology
University of Oregon Medical School
National Institutes of Health, Pre-Doctoral Trainee
Portland, OR

1964 B.S., Aurora College, Highest honors
Aurora, Illinois

Military Service

1954- 1957 U.S. Army Reserve (National Guard) - Fire Direction Control; Graduate, U.S. Army Artillery and Guided Missile Officer Candidate School, Fort Sill, Oklahoma.

1957 - 1961 U.S. Navy, Carrier-based, Air Antisubmarine Squadron 38 &33, Magnetic Anomaly Detection, Electronic countermeasures; Expeditionary Forces Vietnam

Invited speaker at International Conferences and Symposia

MR3 technology: a national strategy for the environment. Cairo, Egypt.

An economic recovery of high quality, single-metal products from electric arc furnace dust and other mixed-metal wastes. TMS Fall 2002 Extraction and Processing Division. Sweden.

MR3 technology for Profitable Metal Recovery from Taiwanese Wastes. (3 seminars.) (1) government officials, (2) circuit board manufactures, and (3) metal finishers.

Hanford Reservation, U.S. Nuclear Regulatory Agency, U.S. Department of Energy, Richland, WA (2 Seminars)

Canadian Nuclear Society, International Conference, Montreal, Canada

High Affinity Radionuclide Metal Capture, Royal Society of Chemistry, England

Cleanup of Soils and Sediments, Canadian Inland Water Resources, Toronto Harbour Commission, Toronto, Ontario (2 symposia)

Natural Resource (Metals) Recovery Technology Leadership Forum, U.S. Department of Energy.

Colloquium on Infectious Diseases, Academy of Sciences, Frankfurt, Germany

Biological implications of Microbial Pathogenicity, Montreal, Canada (3 Symposia)

Epidemic Meningitis, International Congress of Microbiology, Boston, U.S.A.

Biotechnology and Business Congress, Prague, Czech Republic

And others.

Areas of Industrial Research:

Harnessing Kinetic energy (heat) from the earth's atmosphere for the production of mechanical Work and Electricity;

Economical recovery and recycle of metals from solid and liquid wastes, metals plating rinse waters, contaminated ground water, and others;

Recovery of catalytic precious metals from polyalcohols (plastic softeners wastes) waste waters,

Chemical synthesis of high-affinity metal-capture molecules for recovery of Radionuclide from solid and liquid wastes;

Separation and recovery of valuable metals from Electric Arc Furnace Dust waste (Steel);

Solubilization, separation and production of high purity metal products from scrap brass, brass stack dust, zinc skimmings, zinc fines, ore tailings, acid mine water, and others;

Cleaning industrial metals from contaminated soils;

Recovery of Gold from recalcitrant ores;

Separation of Gold and platinum metals by novel selective capture molecules;

A novel and economical means to extract gold and platinum metals from a variety of ores;

A rapid, inexpensive and novel process for the oxidation of reduced, sulfide metal ores;

Recovery and purification and recycle of Vanadium, Chromium, and Titanium from foundry slags;

Control of bacterial growth in various industrial products by means of iron limitation (selective high-affinity metal capture);

Helical device (Heavy Equipment) for the (1) Extractions of metals from ores or solid wastes; (2) the continuous separation of heavy metals from mixed metal extracts or liquid wastes; And others.

Patents: >25 patents and current patents applications worldwide:

Publications

Chapters in books:

(1) *Krasemann, C. (Ed),* DeVoe, I.W. 1983. A view to future studies on the pathogenicity of *Neisseria meningitidis*: beyond antibiotics.
Infektiologisches Kolloquim 1 Neues von„alten" Erregern und neue Erreger , de Gruyter, Berlin 1983.

(2) *Schlessinger, David (Ed)* I. W. DeVoe and J. M. Ingram. *Microbiology* 1977, American Society of Microbiology, Washington, D.C.

(3) Simonson, C. and I . W. DeVoe. 1983. The removal of iron from transferrin at the meningococcal surface. Microbiology 1983. American Society of Microbiology, Washington, D.C.

Articles in Scientific Journals:

DeVoe, I.W. and B.E. Holbein. 1986. A new generation of solid state metal complexing materials: models and insight derived from biological systems. Symposium I (Industrial) Annual Chemical Congress, Royal Society of Chemistry, Kent, England.

DeVoe, I.W., E. Van der Vlist and B.E. Holbein.1985 DeVoe-Holbein technology for the extraction of hazardous waste metals. Hazardous Materials Management Conference, Hamburg, Germany.

Greer, C.W., D. Brener, E.N.C. Browne, I.W. DeVoe, B.E. Holbein, Roger Ek. 1985. Vitrokele ™ composition: Novel, high-affinity, metal-selective

and regenerable media for the removal of radioactive metals from aqueous nuclear waste streams. Waste Management '85.

Holbein, B.E., I.W. DeVoe, L.G. Neirinck, M.F. Nathan, R.Z. Arzonetti 1984. DeVoe-Holbein technology: New technology for closed-loop source reduction of toxic heavy metals in the nuclear and metals-finishing industries. Massachusetts Hazardous Waste Source Reduction Conference Proceedings. E.R. Clark, Bureau Waste Disposal pp 66-88

DeVoe, I.W. and B.E. Holbein.1983. New technology for the high-affinity capture of radioactive metals from water. 4th Annual Conference, Canadian Nuclear Society, Montreal, Canada, pp1-26 to1-43.

Melancon, J., R.A. Murgita, I.W. DeVoe. 1983. Activation of murine B lymphocytes by *Neisseria meningitidis* and isolated meningococcal surface antigens. Infect. Immun. *42*: 471-779.

Brener, D. and I.W. DeVoe 1983. Effects of culture pH on the expression of meningococcal pili. Current Microbiol. *8*: 57-61.

Bohnen, J.M.A., N.V. Cristou, I.W. DeVoe, L. Chiasson and J.L. Meakins. 1982. Anergy secondary to intraperitonal sepsis: An animal model. Surgical Forum. *33*:44-45.

DeVoe, I.W., J. Port, B.E. Holbein, J.M. Ingram. 1982. Thiosulfate reductase activity in *Neisseria meningitidis* FEMS Microbiol. Lett.*14*:267 - 270.

Neirinck, L.G., and I.W. DeVoe 1982. Meningococcal penicillin G tolerance and binding proteins. FEMS Microbiol. Lett. *14*:167 - 170.

Salari, S.H., I.W. DeVoe, and W.S. Powell. 1982. Inhibition of leukotriene B4 synthesis in human polymorphonuclear leukocytes after exposure to

meningococcal lipopolysaccharide. Biochem. Biophys. Res. Comm. *104*: 1517 - 1524.

DeVoe, I.W. 1982. The meningococcus and mechanisms of pathogenicity. Microbiol. Rev. *46*: 162 - 190.

Simonson, C., D. Brener, and I.W. DeVoe. 1982. Expression of high-affinity mechanism for the acquisition of transferrin iron by *Neisseria meningitidis* . Infect. Immun. *36*: 107 - 113.

Archibald, F.S., C. Simonson, and I. W. DeVoe. 1981. Comparison of iron binding and uptake from $FeCl_3$ and Fe-citrate by *Neisseria meningitidis*. Can. J. Microbiol. *27*: 1066 - 1077.

Brener, D., I. W. DeVoe, and B.E. Holbein. 1981. Increased virulence of *Neisseria meningitidis* after in vitro iron-limited growth at low pH. Infect. Immun. *33*: 59 - 66.

Neirinck, L.G. and I.W. DeVoe. 1981. Anomalous cellular morphology and growth characteristics of *Neisseria meningitidis* in subminimal inhibitory concentrations of penicillin G. Antimicrob. Agents Chemother. 19: 911 - 916.

Simonson, C., T. Trivett, and I.W. DeVoe. 1981. Energy-independent uptake of iron from citrate by outer membranes of *Neisseria meningitidis*. Infect. Immun. *31*: 547 - 553.

Yu, E.K.C., and I. W. DeVoe. 1981. L-Cysteine oxidase activity in the membrane of *Neisseria meningitidis*. J. Bacteriol. *145*: 280 - 287.

MacLeod, M.N., and I.W. DeVoe. 1981. Localization of carbonic anhydrase in the cytoplasmic membrane of *Neisseria sicca* (strain 19). Can. J. Microbiol. *27*: 87 -92.

Archibald, F.S., and I.W. DeVoe. 1980. Iron acquisition by *Neisseria meningitidis* in vitro. Infect. Immun. *27*: 322 - 344.

DeVoe, I.W. 1980. The interaction of polymorphonuclear leukocytes and endotoxin in mengococcal disease. A Review. Can. J. Microbiol. *26*: 729 - 740.

Yu, E.K.C., and I. W. DeVoe. 1980. Terminal branching of the respiratory electron -transport chain in *Neisseria meningitidis*. J. Bacteriol. *142*: 879 - 887.

Neirinck, L.G., I. W. DeVoe, and J. M. Ingram. 1980. Events leading to cell death and lysis of *Neisseria meningitidis* in low concentrations of Penicillin G. Antimicrob. Agents Chemother. *17*: 715 - 724.

Archibald, F.S., and I.W. DeVoe. 1979. Removal of iron from human transferrin by *Neisseria meningitidis*. FEMS Microbiol. Lett. *6*: 159 - 162.

Yu, E., I.W. DeVoe, and J. Gilchrist. 1979. A soluble CO and NO binding C-type cytochrome in *Neisseria meningitidis*. Current Microbiology *2*: 201 - 206.

Archibald, F.S., and I. W. DeVoe. 1978. Iron in *Neisseria meningitidis*: Minimum requirements, effects of limitation, and characteristics of uptake. J. Bacteriol. *136*: 35 - 48.

Gilchrist, J.E., and I.W. DeVoe. 1978. Piliation and colonial morphology among laboratory strains of meningococci. J. Clin. Microbiol. *7*: 379 - 384.\

Brener, D., J.E. Gilchrist, and I. W. DeVoe 1977. Relationship between colonial variation and pili morphology in a Group B meningococcus. FEMS Microbiol. Lett. *2*: 157 - 161.

DeVoe, I.W., F. Gilka, J.E. Gilchrist, and E.C.K. Yu. 1977. Pathology in rabbits treated with leukocyte-degraded meningococci in combination with meningococcal endotoxin. Infect. Immun. *16*: 271 - 279.

Ingram, J.M., A.R. Bhatti, and I.W. DeVoe. 1977. High temperature as a probe to study cell division in *Pseudomonas aeruginosa*. Microbiology 1977. David Schlessinger (ed) American Society for Microbiology, Washington, D.C.

DeVoe, I.W. and J.E. Gilchrist. 1976. Localization of TMPD-oxidase in the outer membrane of *Neisseria meningitidis*. J. Bacteriol. *128*: 144 - 148.

DeVoe, I.W. and F. Gilka. 1976 Disseminated intravascular coagulation in rabbits: synergistic activity of meningococcal endotoxin and materials egested from meningococci-ingested leukocytes. J. Med. Microbiol. *9*: 451 - 458.

DeVoe, I.W. 1976. Egestion of degraded meningococci by polymorphonuclear leukocytes. J. Bacteriol. *125*: 258 - 266.

Bhatti, A.R., I.W. DeVoe, and J.M. Ingram 1976. Cell division in *Pseudomonas aeruginosa*: Participation of alkaline phosphatase. J. Bacteriol. *126*: 400 - 409.

Bhatti, A.R., I.W. DeVoe, and J.M. Ingram. 1976. The release and characterization of some periplasmic-located enzymes of *Pseudomonas aeruginosa*. Can. J. Microbiol. *22*: 1425 - 1429.

Lalonde, M. and I. W. DeVoe. 1976. Origin of membrane envelope enclosing the *Alnus crispa var mollis* fern root nodule endophyte as revealed by freeze-etching microscopy. Physiol. Plant Pathol. *8*: 123- 129.

Lalonde, M., R. Knowles, and I.W. DeVoe. 1976. Absence of "void area" in freeze-etched vesicles of the *Alnus crispa var mollis* fern root nodule endophyte. Arch. Microbiol. *107*: 263 - 267.

DeVoe, I.W. and J.E. Gilchrist. 1975. Pili on meningococci from primary cultures of nasopharyngeal carriers and cerebrospinal fluid of patients with acute disease. J. Exp. Med. *141*: 297 - 305.

Lalonde, M. and I.W. DeVoe. 1975. Scanning electron microscopy of the *Alnus crispa var mollis* fern root nodule endophyte. Arch. Microbiol. *105*: 87 - 94.

DeVoe, I.W. and J.E. Gilchrist. 1974. An ultrastructural study of pili and annular structures on the cell surface of *Neisseria meningitidis* . Infect. Immun. *10*: 872 - 876.

DeVoe, I.W. and J.E. Gilchrist. L973. Release of endotoxin in the form of cell wall blebs during in vitro growth of *Neisseria meningitidis*. J. Exp. Med. *138*: 1156 - 1167.

DeVoe, I.W. , J. E. Gilchrist, and D.J. Storm. 1973. Ultrastructural studies on the fate of group B meningococci in human peripheral blood leukocytes. Can J. Microbiol. *19*: 1335 - 1359.

Gow, J.A., I.W. DeVoe, and R.A. MacLeod. 1973. Dissociation in a marine pseudomonad. Can. J. Microbiol. *19*: 695 - 701.

Gilchrist, J.E., and I. W. DeVoe. 1973. Ultrastructure of *Staphylococus epidermidis* after freeze-etching and thin sectioning. Can J. Microbiol. *19*: 294 - 295.

DeVoe, I. W., D. W. Storm, and J.E. Gilchrist. 1973. A study of phagocytosis of radio-labeled *Staphylococcus epidermidis* and on the structural events during intracellular digestion. Can. J. Microbiol. *19*: 525 - 530.

DeVoe, I.W. 1972. In depth study of sources of microbial contamination, biological oxygen demand, chemical oxygen demand, changing thermoclines on the water quality in six recreational lakes in Province of Quebec. Report to the Provincial Government. (Methods and Recommendations became the government standard for recreational lakes.)

Thompson, J. and I.W. DeVoe. 1972. Physiology and morphological effects of phenethyl alcohol upon a gram-negative marine pseudomonad. Can. J. Microbiol. *18*: 841 – 852

DeVoe, I.W. , J.W. Costerton, and R.A. MacLeod. 1971. The demonstration by freeze-etching of a single cleavage plane in the cell wall of a gram-negative bacterium. J. Bacteriol. *106*: 659 - 671.

DeVoe, I.W., J. Thompson, J. W. Costerton, and R.A. MacLeod. 1970. Stability and comparative transport capacity of cells, mureinoplasts, and true protoplasts of a gram-negative bacterium. J. Bacteriol. *101*:1014 - 1026.

DeVoe, I. W. and E. Oginsky. 1969. Cation interactions and biochemical composition of the cell envelope of a marine bacterium. J. Bacteriol. *98*: 1368 - 1377.

DeVoe, I.W. and E. L. Oginsky. 1969. Antagonistic effects of monovalent cations in the maintenance of cellular integrity of a marine bacterium. J. Bacteriol. *98*: 1355 - 1367.

EXHIBIT E

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Irving DeVoe. Confirm. No.: 9677
Application Serial No.: 10/626,209 Group Art Unit: 1797
Filed: July 24, 2003 Examiner: Krishnan Menon
Docket Number: 41056-101
Title: SYSTEM AND METHOD FOR CONVERTING KINETIC ENERGY OF GASES OR LIQUIDS TO USEFUL ENERGY, FORCE AND WORK

DECLARATION UNDER 37 CFR 1.132

I, William Grant McGimpsey, Ph.D. declare and state that:

1. I have been retained and have been paid by Burns & Levinson, LLP on behalf of the Applicant (Inventor), Irving W. DeVoe, and the assignee Effusion Dynamics, Inc. to prepare this Declaration based upon my review of published Patent Application No. 2005/0016924 A1, published on January 25, 2005, naming Irving DeVoe as the sole inventor, and being entitled System and Method for Converting the Kinetic Energy of Gases or Liquids to Useful Energy, Force, or Work as well as the most recent Office Action therein, dated July 2, 2008, the current presented claims, the Loeb and German references, and my own relevant education/experience. I have no other relationship with the inventor, Irving W. DeVoe, or the assignee, Effusion Dynamics, Inc.

2. I am currently Associate Provost for Research and Graduate Studies *ad interim* at Worcester Polytechnic Institute (WPI), Director of the WPI Bioengineering Institute, a Professor of Chemistry at WPI, and the President and Co-Founder, Active Surface Technologies Inc. A more compete CV is attached hereto as Exhibit A

3. I received my B.Sc. in Chemistry from Brock University, St. Catharines, Ontario, Canada in 1978.

4. I received my M.Sc.in Chemistry from Brock University, St. Catharines, Ontario, Canada in 1981.

5. I received my Ph.D. in Physical Chemistry from Queen's University, Kingston, Ontario, Canada in 1985

6. I completed 4.5 years as a research associate at the National Research Council of Canada from 1985-1989.

7. I joined WPI in 1989 as an assistant professor of chemistry, was appointed an Associate Professor in 1994 and promoted to a full Professor in 1998.

8. I have taught Chemical Thermodynamics to engineering and science majors at WPI from 1989 to 2005. In addition, I have taught hundreds of classroom hours in thermodynamics with focus on the first and second laws, the kinetic theory of gases, equilibrium, colligative properties such as boiling point elevation and osmotic pressure, phase diagrams etc., and, consequently, feel qualified to understand the skill level of one of ordinary skill in the art of thermodynamics, osmotic pressure and energy transfer.

9. In my position as associate provost, I oversee the WPI Office of Technology Transfer and I am familiar with evaluating intellectual property with respect to potential patentability.

10. I am a named inventor on 5 issued US Patents. (7,214,538; 6,902,720; 6,893,716; 6,746,595; 6,660,526)

With reference to the published application, I declare and state that:

11. I have read and reviewed the above-identified Published Patent Application No. 2005/0016924 A1, published on January 25, 2005 and understand the published patent application including its specification and the currently presented claims as well as all of the figures contained therein.

12. I have read and reviewed the above-identified Office Action dated July 2, 2008 and the Loeb reference (US Patent 3,906,250) and the German reference (DE 3121968) cited in the office action and I understand the contents thereof and factual issues raised in or by the Office Action.

13. I have read and reviewed the Loeb and German references provided to me by Burns and Levinson that pertain to the current application.

14. I have read and reviewed the currently presented claim amendments prepared by Burns and Levinson, specifically where the claims have been labeled Currently Amended, Canceled, and Previously Presented. I state here that I agree with these amendments and further state that in my opinion they represent valuable amendments to the claims and do not materially change the concepts nor diminish the novelty of the application.

15. The invention described and claimed in the published patent application involves a system for the use of osmotic fluid flow to generate fluidic pressure that can be coupled with a mechanical device, such as a piston, to convert the generated fluidic pressure into mechanical energy. The inventor accurately ascribes the energy considerations of this device to the conversion of molecular kinetic energy, i.e., thermal energy, in one embodiment, to the kinetic energy of a piston.

16. In my opinion, it is well disclosed in the application for purposes of one of ordinary skill in the art that the system operates in three states. In an initial state there is a concentration gradient between the solvent and pressure chambers caused by the osmotic pressure generated by the movement of solvent solution across the semi-permeable membrane into the solute solution. In an intermediate state, an equilibrium has been achieved between the osmotic pressure exerted by the solvent chamber and the mechanical pressure exerted by the pressure chamber. To reach this intermediate equilibrium state, work will flow out of this system as a result of a piston moving in response to the generated fluidic pressure developed in the pressure chamber. Finally, in a third state, the system is regenerated to the initial state by the introduction of solute into the pressure chamber and solvent into the solvent chamber and by the addition of energy to the system.

17. Claim 42 as currently amended in the response provided herein describes how a system, which in its initial state includes of a solute-solvent sub-system separated from a pure solvent sub-system by a semi-permeable barrier, undergoes a change such that pure

solvent flows through the barrier from the pure solvent sub-system to the solvent-solute sub-system. This solvent flow is driven thermodynamically by the concentration gradient between the two sub-systems and continues until an equilibrium condition is reached in which the magnitude of the concentration gradient is decreased. In the process, a pressure gradient is produced due to the increase in the amount of material in the solvent-solute sub-system and the decrease in the amount of material in the pure solvent sub-system. Claim 42 correctly claims that this pressure gradient can be used to create work through the induced motion of a piston. Further, Claim 42 also correctly claims that regenerating the concentration gradient can be achieved through the removal of a portion of the solute-solvent sub-system to a separate chamber, the application of energy to evaporate a portion of the solvent from this chamber and the addition of the remaining concentrated solute to the solute-solvent sub-system. Effectively this regenerates the initial concentration gradient of the solute-solvent sub-system. Claim 42 includes a thermodynamically allowed processes, i.e., there are no thermodynamic laws violated in this claim.

18. Previously presented Claims 47 and 48 describe the recovery of solvent and its addition to the solvent sub-system, again effectively regenerating the initial state of the solvent system.

19. Claim 50 repeats Claim 42 with the addition of an embodiment in which the work that is caused to be created by the pressure gradient is manifested in the linear displacement of a piston. Claim 50 therefore likewise includes a thermodynamically allowed processes, i.e., there are no thermodynamic laws violated in this claim.

20. Claims 68 and 71 describe the application of energy to evaporate solvent from the solvent-solute mixture that is diluted by the flow of solvent through the barrier.

21. It is my opinion that, based upon my review of the published application, the currently presented claims, and the Office Action, all referred to above, that one of ordinary skill in the art

would be able to practice the invention based upon the teachings and description set forth in the specification of the application.

22. In addition, I have been asked by Attorney Thomas Grodt of Burns & Levinson, LLP as to my opinion on the patentability of the present claims over the Loeb reference (US Patent 3,906,250) and the German reference (DE 3121968). As stated above, I have read the Loeb and German references and it is my opinion that both the Loeb and the German references function in a continuous manner and basis and that the extra energy the system produces for mechanical power is provided by the addition of a substantial volume of solvent being continuously added to the solute. In contrast, the presently claimed invention of DeVoe relies upon an increase in pressure (not volume) provided by the addition of solvent to the solute solution as it passes through a semipermeable membrane from the solvent container into the solute container as described in the DeVoe specification. The Loeb and German references do not rely on an increase in pressure because of the continuous flow of solvent into the solute across the semipermeable membrane in what is not a closed system. The presently claimed invention clearly recites periodically extracting a portion of the solvent solution at the increased pressure to provide the necessary energy to drive an object and perform mechanical work. Based upon my understanding of one of ordinary skill in the art, neither the Loeb reference nor the German reference describes the claimed invention. Therefore, neither the Loeb reference nor the German reference can be used to negate the patentability of the presently claimed invention. Likewise, given the differences in the methods of operation between the presently claimed invention and the Loeb and German references, it would not be obvious to one of ordinary skill in the art to modify either the Loeb reference or the German reference as the Examiner suggests. Since the operation of the Loeb and German references are inherently different than the presently claimed invention, the presently claimed invention is clearly patentable over the Loeb and German references .

I further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States

Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

William Grant McGimpsey, Ph.D.

November 26/08
Date

ATTACHMENT A

C.V. OF PROF. GRANT MCGIMPSEY, Ph.D.

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PROFESSIONAL SUMMARY

- Associate Provost for Research and Graduate Studies *ad interim*
- Director, WPI Bioengineering Institute
- WPI Trustees Award for Outstanding Research and Creative Scholarship
- >$9 million funding from corporate and government sources (as PI, co-PI)
- President and Co-Founder, Active Surface Technologies Inc.

CURRENT RESPONSIBILITIES at WORCESTER POLYTECHNIC INSTITUTE

Associate Provost for Research and Graduate Studies* (ad interim) *(Appointed 2007):

- Enhance government and corporate sponsored research programs
- Establish and enhance collaborative research relationships with other institutions
- Manage Congressionally appropriated funds
- Oversee Office of Research Administration, Office of Research and Graduate Studies, Office of Technology Transfer

Director, WPI Bioengineering Institute (Appointed 2005)

- Establish research funding streams to create technology pipeline
- Establish multidisciplinary faculty teams to pursue funding
- Identify technologies for IP protection and out-licensing opportunities
- Establish and foster academic-corporate research partnerships
- Commercialize medical technologies by creating start-up companies

Professor of Chemistry, Worcester Polytechnic Institute (WPI), Worcester, MA
(Appointed Assistant Professor 1989, Associate Professor 1994, Professor 1998)

- Research interests include: Surface chemistry; Thin Film Devices; Optical and Electrochemical Sensors; Biosensors; Nanofluidics; Photoswitchable surfaces

- Teaching interests include: Surface Chemistry; Nanoscience; Thermodynamics; Kinetics

OTHER CURRENT POSITIONS

Adjunct Research Professor, UMASS Medical School (Appointed 2004)

- Develop surface modification methods to prevent biofilm formation on surgical devices

President and Co-Founder, Active Surface Technologies Inc.

- ASTI creates novel medical and solar energy devices using its patented thin film technology.

PAST POSITIONS

Consultant, Argose Incorporated, Waltham, MA (2002-2004)

Design and synthesis of novel fluorophores as glucose sensors. (Proprietary)

Visiting Professor, University of Massachusetts Medical School, Worcester, MA (2002-2003)

Cancer Biology. Identification and characterization of centrosome protein complexes in human tumor cells. Established stable cell lines to express high endogenous levels of TAP-tagged centrosome proteins (pericentrin, kendrin). (Sabbatical. Sponsor: US Army)

Consultant, Bayer Business Group Diagnostics, Medfield, MA (2000-2003)

Lead technical consultant in development of sensors for the detection of electrolytes, urea and enzymes in blood. Designed, synthesized and confirmed viability of new ion-selective ionophores and bulk optodes.

Visiting Scientist, Max-Planck-Institut für Strahlenchemie, Mülheim, Germany (1995-1996)

Directed activities of technical personnel and carried out research on photoionization of aromatic amino acids. Work led to publication and several funded research proposals. (Sabbatical. Sponsor: Deutsche Akademische Austauschdienst)

Consultant, Aspen Systems, Marlborough, MA (1993-1995)

Sub-contractor for Phase I SBIR laser eye protection project. Directed graduate students in the synthesis and spectroscopic evaluation of laser eye protection materials based on multiphoton response.

Consultant, Polaroid Corporation, Cambridge, MA (1992-1994)

Directed graduate and undergraduate student research in the design and evaluation of one- and two-photon photoacid generators for photolithographic applications.

POST-DOCTORAL RESEARCH EXPERIENCE

Research Associate, National Research Council Canada, Ottawa, Canada (1987-1989), Molecular Materials Group. (Bryn Mile, Advisor)

Synthesis and EPR characterization of metal/organic materials. Developed in-situ laser ablation and magnetron sputtering techniques for evaporation and deposition of metals.

Research Associate, National Research Council Canada, Ottawa, Canada (1984-1987), Reaction Intermediates Group (J.C. (Tito) Scaiano, Advisor)

Laser investigation of photochemical and photophysical processes in solution and the solid state. Two-laser, two-color photochemistry.

EDUCATION

Ph.D. (Physical Chemistry), Queen's University, Kingston, Ontario, Canada. 1985
Dissertation: An ESR study of the reactions of phosphorus and organometallic radicals with thioketones.

M.Sc. (Chemistry). Brock University, St. Catharines, Ontario, Canada. 1981
Thesis: Solute effects on the generation and decay of primary species in the flash photolysis of indole.

B.Sc. (Chemistry). Brock University, St. Catharines, Ontario, Canada. 1978

AWARDS and HONORS

- WPI Trustees Award for Outstanding Research and Creative Scholarship 2002
- Leonard P. Kinnicutt Chair in Chemistry, Worcester Polytechnic Institute. 1993-1995
- NSERC Postgraduate Fellowship. 1981-1984
- Ontario Graduate Fellowship 1979

OTHER ADMINISTRATIVE DUTIES

- Chair, President's Commission on Research and Graduate Education (2004-present)
- Member, President's Task Force (2004-2006)
- WPI Committee on Appointments and Promotions (2004 – present, currently secretary)
- Provost Search Committee (2004)
- WPI Committee on Research Misconduct (2004)
- Chair, Department Graduate Studies Committee (1995-2005)
- Secretary and Co-Chair, Committee on Tenure and Academic Freedom (1999-2002)
- Secretary and Chair, Committee on Graduate Studies and Research (1997-2000)

PUBLICATIONS and PATENTS

Book Chapters

1) McGimpsey, W. G. "Spectroscopy and Reactivity of Upper Excited States and Excited Reaction Intermediates" Molecular and Supramolecular Photochemistry, 1998, *2*, 249-306.

2) McGimpsey, W. G. "Photochemistry of Upper Excited States and Excited Reaction Intermediates." Trends in Organic Chemistry. 1997, *6*, 233-257.

3) McGimpsey, W. G. "Laser Induced Multiphotonic Processes in Polymer Chemistry" in CRC Press: Applications of Lasers in Polymer Science and Technology 1990.

4) McGimpsey, W. G. "Properties of Upper Excited States and Excited Reaction Intermediates" in CRC Press: Handbook of Organic Photochemistry 1989.

Patents

5) Benco, J. S.; Nienaber, H.; McGimpsey, W. G. " Device and method for the determination of lithium ion concentration in a biological fluid." US Patent Number: 7,214,538

6) McGimpsey, W. G. "Cyclic Peptide Structures for Molecular Scale Electronic and Photonic Devices" US Patent Number: 6,902,720

7) McGimpsey, W. G.; MacDonald, J. C. "Non-Covalent Assembly of Multilayer Thin Film Supramolecular Structures" US Patent Number: 6,893,716

8) Benco, J. S.; McGimpsey, W. G. "Ammonium Ionophore. An Ammonium ion selective matrix, an ammonium ion-selective sensor and a method for detecting ammonium ions in a fluid sample." US Patent Number: 6,746,595

9) Benco, J. S.; McGimpsey, W. G. Nienaber, H. "Potassium Fluoroionophore" US Patent Number: 6,660,526

10) Lambert, C. R.; McGimpsey, W. G. "Imagewise patterning of films and devices comprising the same." (Utility Application) (2006)

11) Lambert, C.R.; McGimpsey, W. G. "A Dual Transduction Method of Detecting Analytes." (Utility Application) (2005)

12) Cyganski, D.; McGimpsey, W. G. "Sub-Wavelength Photolithography" (Utility Application) (2004)

13) McGimpsey, W. G.; MacDonald, J. C. "Switchable Surface Wettability" (Utility Application) (2004)

Journal Articles

14) Soto, E.; MacDonald, J. C., Cooper, C. G. F.; McGimpsey, W. G. "Non-covalent Assembly of Photocurrent Generating Multilayered Thin Films." To be submitted.

15) Bush, K. A.; Driscoll, P. F.; Soto, E. R.; Lambert, C. R.; McGimpsey, W. G.; Pins, G. D. "Designing Tailored Biomaterial Surfaces to Direct Keratinocyte Morphology, Attachment, and Differentiation." *Journal of Biomedical Materials Research.* In press.

16) Driscoll, P. F.; Phewluangdee, M.; Soto, E.; Cooper, C. G. F.; MacDonald, J. C.; Lambert, C. R.; McGimpsey, W. G. "Photocurrent Generation in Non-Covalently Assembled Multilayered Thin Films" *Langmuir* In Press.

17) Purohit, N.; Wanichacheva, N.; Driscoll, P.; Lambert, C. R.; McGimpsey, W. G. "Reversible Photoswitchable Wettability in Non-Covalently Assembled Multilayered Films" *Langmuir* 2007, 23, 13181.

18) Emerson, R. J., IV; Bergstrom, T. S.; Liu, Y.; Soto, E. R.; Brown, C. A.; McGimpsey, W. G.; Camesano, T.A. "Microscale Correlation between Surface Chemistry, Texture, and the Adhesive Strength of *Staphylococcus epidermidis" Langmuir 2006, 22,* 11311.

19) Wanichecheva, N.; Soto, E.; Lambert, C. R.; McGimpsey, W. G. "Surface-Based Lithium Ion Sensor: An Electrode Derivatized with a Self-Assembled Monolayer." *Analytical Chem.* 2006, *78,* 7132.

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21) Benco, J. S.; Nienaber, H. A.; McGimpsey, W. G. "A Highly Selective Fluoroionophore for the Detection of Lithium Ions: 9-Anthryl-Substituted Azacrown Ether Covalently-Linked to a 1,3-Alternate Calix[4]arene." *J Photochem. Photobiol. A: Chem.* 2004, *162,* 289.

22) Cooper, C. G. F.; MacDonald, J. C.; Soto, E.; McGimpsey, W. G. "Non-Covalent Assembly of a Photoswitchable Surface." *J. Am. Chem. Soc.* 2004, *126,* 1032. (Communication to the Editor)

23) Soto, E.; MacDonald, J. C.; Cooper, C. G. F.; McGimpsey, W. G. "A Non-Covalent Strategy for the Assembly of Supramolecular Photocurrent-Generating Systems." *J. Am. Chem. Soc.* 2003, *125,* 2838. (Communication to the Editor)

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